WHAT IS CLAIMED IS:

1. A control apparatus for a vibration type actuator, the vibration type actuator comprising a rotatable moving member, an elastic member contacting the moving member, and an electro-mechanical energy conversion element exciting at least three different kinds of vibrations in the elastic member by supplying at least three periodic signals with different phases, the control apparatus supplying the periodic signals to the vibration type actuator in order to rotate the moving member to a target position, comprising:

a rotation axis determining unit which determines a rotation axis for rotating the moving member to the target position;

a parameter determining unit which determines, by using an inverse model, phases and amplitudes of the periodic signals for rotating the moving member around the rotation axis determined by the rotation axis determining unit; and

a control circuit which supplies the periodic signals having the phases and amplitudes determined by the parameter determining unit to the electro-mechanical energy conversion element.

2. The control apparatus for a vibration type actuator according to claim 1,

wherein the rotation axis determining unit determines a rotation axis for rotating the moving member to the target

position with a minimal driving amount.

3. The control apparatus for a vibration type actuator according to claim 1, further comprising:

a position detection unit which detects a current position of the moving member;

wherein the rotation axis determining unit determines the rotation axis based on the target position and the current position detected by the position detection unit.

4. The control apparatus for a vibration type actuator according to claim 1,

wherein the parameter determining unit includes a plurality of inverse models respectively corresponding to each state of the rotation axis;

wherein one of the plurality of inverse models is selected in accordance with the state of the rotation axis determined by the rotation axis determining unit; and

wherein the phases and amplitudes of the periodic signals are determined by using the selected inverse model.

5. The control apparatus for a vibration type actuator according to claim 4,

wherein at least one of the plurality of inverse models is a non-linear model using a non-linear converter which performs a non-linear conversion.

6. The control apparatus for a vibration type actuator according to claim 5,

wherein at least one of the plurality of inverse models is a linear model using a linear converter which performs a linear conversion.

7. The control apparatus for a vibration type actuator according to claim 1,

wherein the inverse model is a non-linear model using a non-linear converter which performs a non-linear conversion.

8. The control apparatus for a vibration type actuator according to claim 5,

wherein the non-linear converter is constructed of a neural network.

9. The control apparatus for a vibration type actuator according to claim 6,

wherein the at least three different kinds of vibrations include a longitudinal vibration in a z-axis direction passing through a vicinity of a center of the elastic member and the moving member, and lateral vibrations in an x-axis direction and a y-axis direction which are substantially perpendicular to one another as well as to substantially perpendicular to the z-axis direction; and

wherein, when a vector of the rotation axis determined by the rotation axis determining unit substantially coincides

with the z-axis, or when the vector is located in an x-y plane, then the linear model is selected from the plurality of inverse models, and in all other cases, the non-linear model is selected.

10. The control apparatus for a vibration type actuator according to claim 1, further comprising:

an amplification rate determining unit which determines amplitude amplification rates of the amplitudes of the periodic signals, based on the current position and the target position of the moving member; and

an amplitude determining unit which determines as the amplitude of each of the periodic signal, a value obtained by multiplying the amplitude determined with the parameter determining unit with the amplitude amplification rates.

11. A vibration type actuator system, comprising:

the control apparatus for a vibration type actuator according to claim 1; and

a vibration type actuator whose drive is controlled by the periodic signals supplied from the control apparatus.

12. A method for controlling a vibration type actuator, the vibration actuator comprising a rotatable moving member, an elastic member contacting the moving member, and an electro-mechanical energy conversion element exciting at least three different kinds of vibrations in the elastic member by

supplying at least three periodic signals with different phases, the control method supplying the periodic signals to the vibration type actuator in order to rotate the moving member to a target position, comprising:

a first step of determining a rotation axis for rotating the moving member to the target position;

a second step of determining, by using an inverse model, phases and amplitudes of the periodic signals for rotating the moving member around the rotation axis determined in the first step; and

a third step of supplying the periodic signals having the phases and amplitudes determined in the second step to the electro-mechanical energy conversion element.

13. The method for controlling a vibration type actuator according to claim 12,

wherein in the first step, the rotation axis is determined, with which the moving member is rotated to the target position with a minimal driving amount.

14. The method for controlling a vibration type actuator according to claim 12,

wherein in the second step, one of a plurality of inverse models respectively corresponding to each state of the rotation axis is selected in accordance with the state of the rotation axis determined in the first step, and the phases and amplitudes of the periodic signals are determined by using the selected

inverse model.

15. The method for controlling a vibration type actuator according to claim 14,

wherein a non-linear model constructed of a neural network and using a non-linear converter performing a non-linear conversion is used for at least one of the inverse models.